

was pre-eminent, it was that to which this work relates. Upon it hangs a great number of collateral industries, and their prosperity is bound up together and is mutually dependent. We had abundant stores of most things we needed to extend and develop this industry, and whatever else we required our oversea trade enabled us to procure. That supremacy is challenged. Newer methods have undermined the position which the industry enjoyed with us for so many years, and in which such large amounts of British capital are still locked up. So long as we were concerned with the application of the simplest chemical principles we could hold our own by virtue of our natural advantages. Immediately we were confronted by new processes involving more recondite principles, questions of chemical dynamics, and abstract considerations of mass-actions, reversible reactions and the like, our manufacturers were powerless; nor were they able to find in this country the help they needed. Some of them eventually found it in imported polytechnically trained German and Swiss chemical engineers—for the most part university men with post-graduate technical training—men that the German and Swiss systems produce in abundance.

This system of fighting our industrial battles, in fact, resembles that on which decadent Rome depended for her national existence, and which eventually proved her ruin. It is true, we are beginning to wake up, and sporadic efforts are being made in various directions to rouse the country from its lethargy. Large sums of money are being spent, but whether always wisely is very doubtful. Anything like control, or action directed from outside, is resented, for there is no controlling authority armed with the necessary powers, or, even if it were armed, commands general confidence. We can only hope that "we shall worry through somehow," but if we do, it will only be, as hitherto, by the expenditure of a vast amount of fussy energy, much delay, and waste of money and means.

SOUNDING ROUND THE ANTARCTIC CONTINENT.

Deutsche Südpolar-Expedition, 1901-3. Band ii., Geographie und Geologie. Heft vi., Die Grundproben der Deutschen Südpolar-Expedition, 1901-3. By E. Philipp. Pp. 415-616+xxxi-xxxiii plates. (Berlin: Georg Reimer, 1910.)

THIS memoir forms the sixth division of the second volume—that devoted to geography and geology—of the reports on the German South Polar Expedition, under Prof. von Drygalski, in the *Gauss*. Since the issue of this important memoir, the news has arrived of the great loss which science has sustained by the death of its talented author.

During the whole of the voyage out to the Antarctic Ocean, frequent soundings were taken, directly the equator was crossed. Thirty soundings are recorded between the equator and the Cape of Good Hope, and eighteen more between the Cape and the ice-limit. In the same way, on the return voyage, eighteen soundings were obtained during the somewhat cir-

cuitous course by way of the Heard, Kerguelen, St. Paul, and New Amsterdam islands, and by the south of Madagascar back to the Cape; thence to the equator, by a different course to the outward one, thirty-nine further soundings were taken. The methods of obtaining samples of the sea-bottom, in the case of these soundings, and the subsequent treatment of the materials in the laboratory, are fully discussed in the memoir, and the careful descriptions of the specimens of the globigerina and diatomaceous oozes, and of the blue and red muds, are supplemented by mineralogical notes by Dr. R. Reinisch, and chemical analyses by Dr. J. Gebbing. On the chart, a graphic illustration is given of the nature of the sea-bottom at each of the stations, and this part of the work is of considerable value as adding fresh materials for a description of the exact character of the floors of the South Atlantic and Indian Oceans. The descriptions of the soundings and the tabular statements concerning them are very complete, and will prove of great value for purposes of comparison.

The portion of the memoir which will perhaps excite the greatest interest, however, is that which deals with the materials obtained in soundings along the margin of the Antarctic pack-ice. The thirty-three soundings in which specimens of the ocean floor were obtained are valuable as giving indications of the geological structure of that portion of the Antarctic continent lying between the meridians of 80° and 96° E. The mineral fragments, which have been very carefully examined and described, must have been brought down by glaciers from the interior of the continent. Among the larger fragments occur granitic rocks, gneisses, amphibolites, and other crystalline schists, with a red quartzitic sandstone, coarse or fine grained, and, more rarely, gabbro. Of recent volcanic rocks, fragments of basalt and of volcanic glass are recorded from a few stations only, and it is suggested that possibly these may have come, not from the continental lands, but from some island or islands lying within the limits of the ice-pack, or possibly they may be the products of submarine eruptions.

The long list of minerals given from the different soundings confirms the conclusions drawn from the study of the rock-fragments, for they nearly all belong to species characteristic of granitic rocks and the older crystalline schists. The study of the sandy or muddy materials in which these rock and mineral fragments are embedded shows that, as a rule, they are free from calcareous matter. Of the thirty-three deposits examined, only one was found to contain any considerable proportion of calcium carbonate, nearly 20 per cent.; four others contained from 1 to 5 per cent., and four others mere traces; the remaining twenty-four were perfectly free from all calcareous matter. Although the glacial muds graduate, in passing northwards towards warmer seas, into the diatomaceous ooze, the remains of the microscopic algæ are not abundant in the muds from the borders of the pack-ice. Some foraminifera occur, and glauconite was detected in five of the soundings.

The study of this very complete and suggestive memoir cannot fail to increase the regret which must be universally felt in the scientific world at the death, so early in his career, of its distinguished author.

J. W. J.

READABLE BOOKS IN NATURAL KNOWLEDGE.

Wonders of Physical Science. By E. E. Fournier. Pp. viii+201.

Tillers of the Ground. By Dr. Marion I. Newbigin. Pp. viii+224.

Threads in the Web of Life. By Margaret R. Thomson and Prof. J. Arthur Thomson. Pp. vii+198. (London: Macmillan and Co., Ltd., 1910.) Price 1s. 6d. each.

SOME years ago a new series of "Readable Books in Natural Knowledge" would have been a gift of doubtful value to the teacher. Written by the capable hands that have made the present volumes, they could not have failed to awaken here and there the genuine passion for scientific inquiry, and so would have seemed to justify their existence. But, speaking generally, the more completely such books had succeeded in "popularising" the labours of the *savant* the further they would have been held to direct the attention of the teacher from the proper aim of instruction in science. We now recognise that that aim is not so much to make the pupil acquainted with certain ranges of facts as to train him in the exercise of one of the most important forms of human activity. Thanks largely to the tireless propaganda of Prof. Armstrong, this aim is at present pursued with more or less intelligence wherever it is claimed that science is being taught. The boy learns that the essence of science consists in putting a clear question to nature and wresting from her a clear answer to it. In favourable circumstances he acquires some of the mental habits essential to success in this pursuit, or at any rate is made to see that such success comes only of faithfulness and labour.

It was natural that the training value of heuristic methods should be emphasised by their advocates since this element was almost entirely absent from the older didactic methods. But modern pedagogy, instructed by the results of psychological inquiry, has become critical of the claims of a subject to train or cultivate "faculties," and prefers to find in the nature of the subject itself the justification for teaching it. Thus the prime reason for teaching science is that, intrinsically and in its results, the scientific activity is one of the greatest and worthiest types of human effort. An education that does not give a sympathetic acquaintance with it is, therefore, necessarily incomplete. Whatever other arguments may be urged in their favour, heuristic methods in science teaching are rendered necessary by the fact that by them alone the pupil is made actually to exercise the scientific activity, and so to gain direct knowledge of one of the cardinal forms of human achievement. But when by first-hand experience he has genuine knowledge of the scientific activity, he should also have opportunities of appreciating its significance in human history. It is

NO. 2128, VOL. 84]

precisely to serve this function that the present series of "Readable Books" has been designed. To quote the publishers' note, they "aim at exalting the scientific spirit which leads men to devote their lives to the advancement of natural knowledge, and at showing how the human race eventually reaps the benefit of such research."

It may be said at once that in the first three books of the series this aim has been already admirably fulfilled. The authors have approached their task in the right temper, and have, on the whole, been remarkably happy, both in the choice and in the treatment of their topics. Mr. Fournier takes ground, a great part of which has been worked over by predecessors, but he has evidently gone himself to the works of the great physicists, and his chapters have the freshness and force derived from this direct contact. Dr. Marion Newbigin tells of the evolution and spread of food-plants with an epical directness and unity of plan. An episode in the development of Transatlantic commercialism—such as the transportation of Smyrna figs to California—becomes in her hands a wonderfully impressive illustration of the working of the scientific spirit. Mrs. and Prof. J. A. Thomson have taken a subject which hardly lends itself to the same unity of treatment. In part, their object is to exhibit the dependence of man upon deliberate or unconscious partnership with animals—such as the domesticated animals on the one hand, and earthworms on the other. They come nearer to the special aim of the series in the chapters where they show what tremendous results depend upon the scientific investigation of the life-histories of microscopic parasites. It is unnecessary to say that both parts of their programme are admirably executed.

A notable characteristic of each of the books is that they bring the tale of scientific conquests down to our own days. Thus Mr. Fournier describes Röntgen's discovery of the X-rays, and tells the story of aviation down to Blériot's flight across the Channel last year. Dr. Newbigin gives capital chapters on the work of Mendel, de Vries, and their followers. Prof. and Mrs. Thomson have a chapter on the relation between mosquitoes and malaria, as well as one on Pasteur. In short, these most interesting and stimulating little books initiate a series which will at once prove of great value as an adjunct to the systematic instruction of the class-room and laboratory, and, if continued in the same spirit and with the same ability, will become an almost indispensable part of a school equipment for science teaching.

T. P. N.

SALMON AND TROUT.

Life-history and Habits of the Salmon, Sea-trout, Trout, and other Fresh-water Fish. By P. D. Malloch. Pp. xvi+263. (London: Adam and Charles Black, 1910.) Price 10s. 6d. net.

THIS book is almost entirely devoted to the salmon of the Tay, sea-trout, and brown trout. "The other fresh-water fish" are but slightly dealt with, and the chapters allocated to them call for no particular notice, save to direct attention to the start-